Cornea:
Infective Keratitis

- Jan van der Hoek
- York & Scarborough Teaching Hospitals NHS Trust
- North Yorkshire, UK

- *January 2005 Updated 2025 -*

New Faces





New Faces







Scarborough: NE coast of UK

Population: predominantly Caucasian and elderly

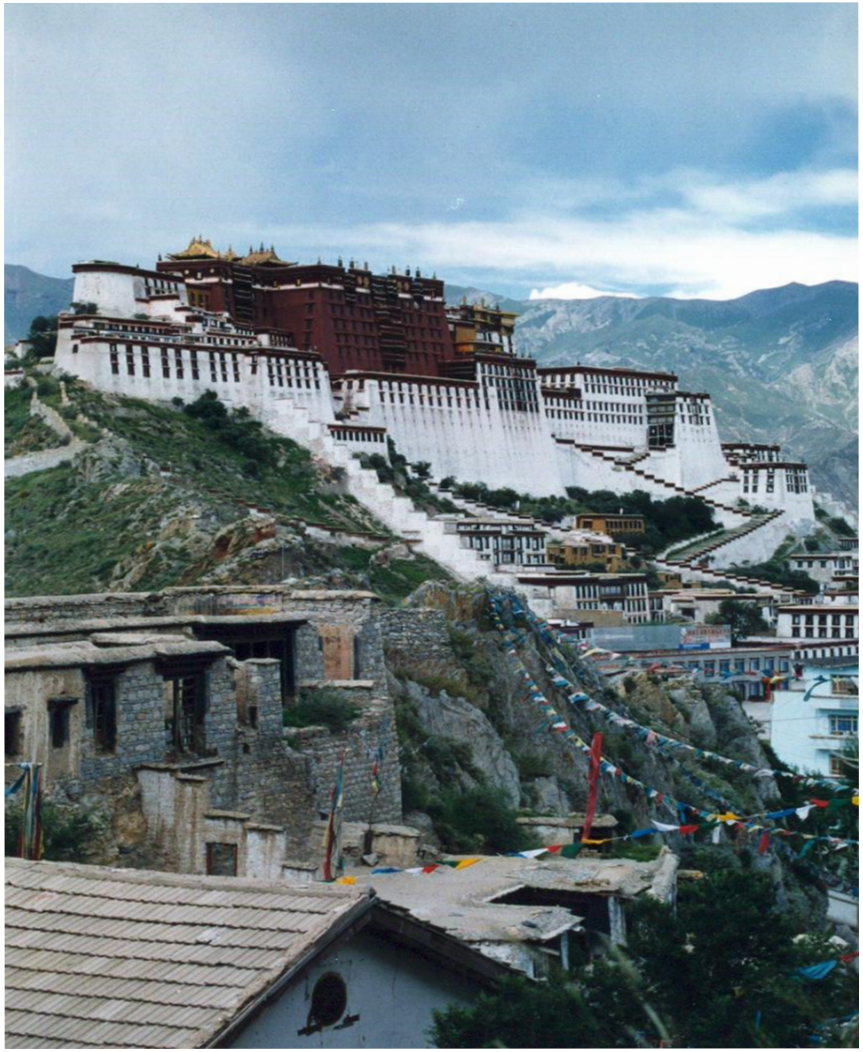

















LEH
49
NIMMU
13



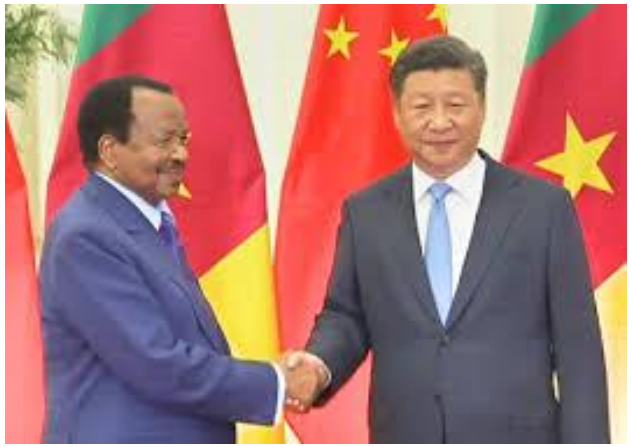


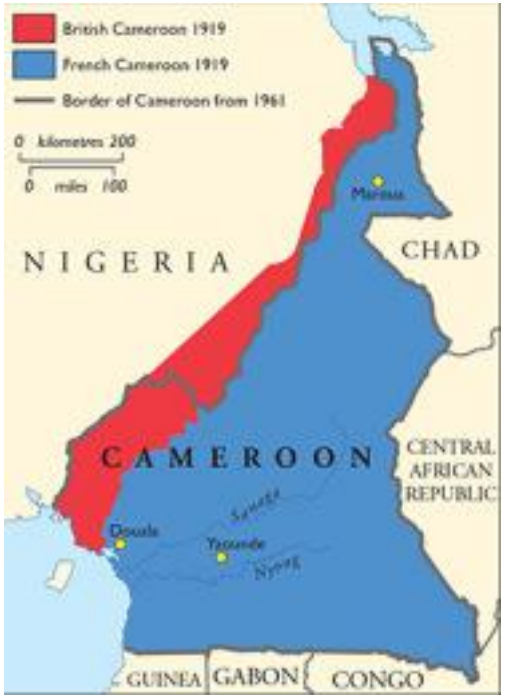

CENTRE DE SANTE
ST MATHIEU ANNEXE
SERVICE OPHTALMOLOGIE
JOURS D OUVERTURE
DE LUNDI A VENDREDI
14H30






Je ne suis pas
ANGLOPHONE
Je ne suis pas
FRANCOPHONE




British Cameroon 1919
French Cameroon 1919
Border of Cameroon from 1961
0 kilometres 200
0 miles 100
NIGERIA
CHAD
CAMEROON
CENTRAL AFRICAN REPUBLIC
Douala
Yaounde
GUINEA
GABON
CONGO

World Blindness

Vision 2020 launched in 1999

Goal: eliminate avoidable blindness by 2020

285 Million people <6/18 (314)

39 Million Blind (<3/60) (45)

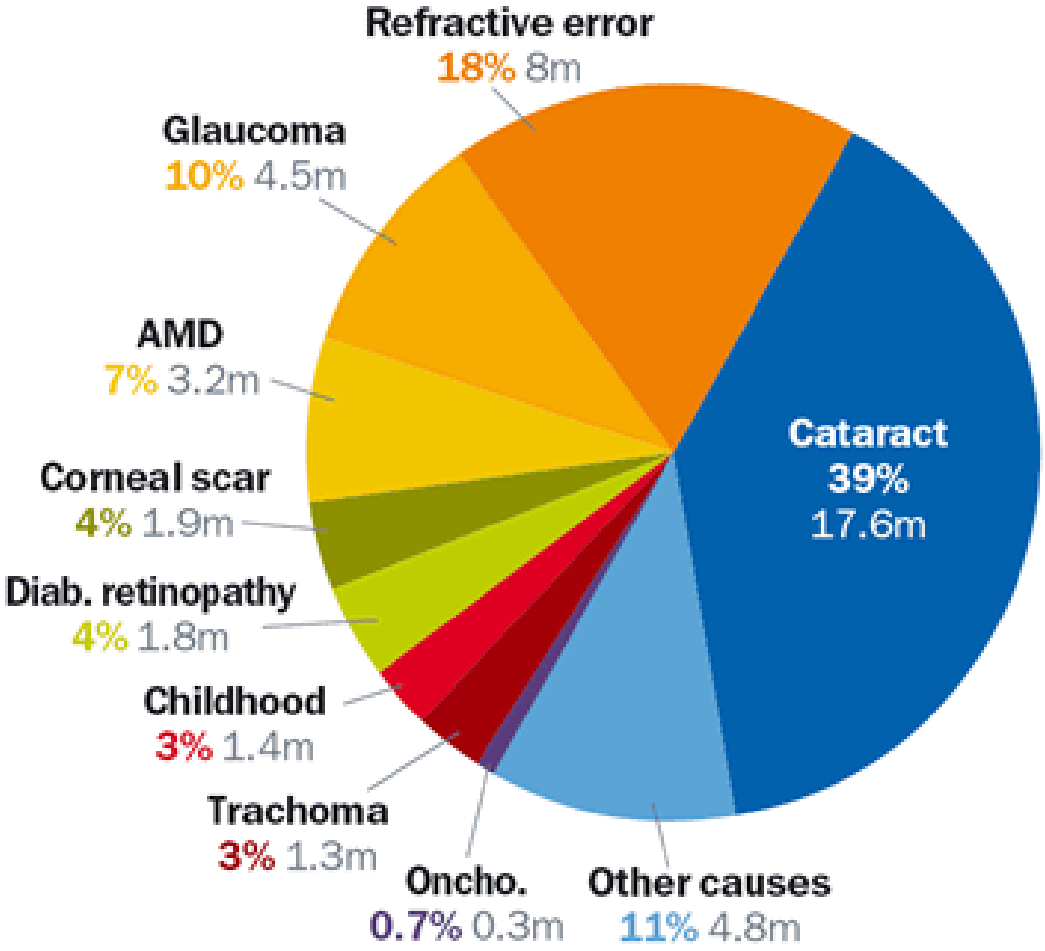
Overall population increase

18% increase of over 50's

Cheap IOLs available since 90's

Number of cataract extractions increased significantly (15 million)

Improvement in child health has led to reduction of vit A related corneal blindness



Latest IAPB Data

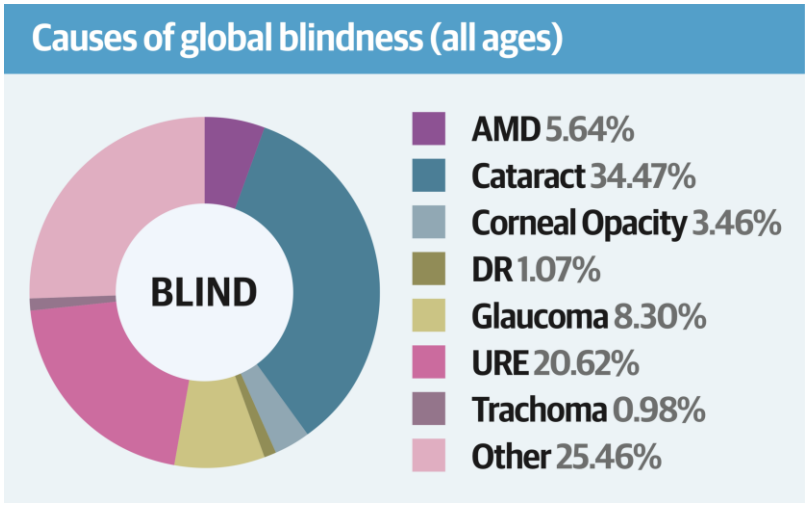


Table 1 – Number of people globally with distance visual impairment by cause

	Number in Millions		
Cause	**Blind**	**MSVI**	**Visual Impairment (Blind + MSVI)**
Age-Related Macular Degeneration (AMD)	1.96	8.41	10.37
Cataract	12.60	52.60	65.20
Corneal Opacity	1.28	2.89	4.17
Diabetic Retinopathy (DR)	0.36	2.57	2.93
Glaucoma	2.96	4.05	7.01
Uncorrected Refractive Error (URE)	7.42	116.34	123.76
Trachoma	0.40	1.60	2.00
Other	9.04	28.13	37.17
All Causes	**36**	**217**	**253**





Corneal Disease

- Significant cause of blindness after cataract and refractive error
- Leading cause of childhood blindness
- Under-reported cause of monocular visual loss and morbidity

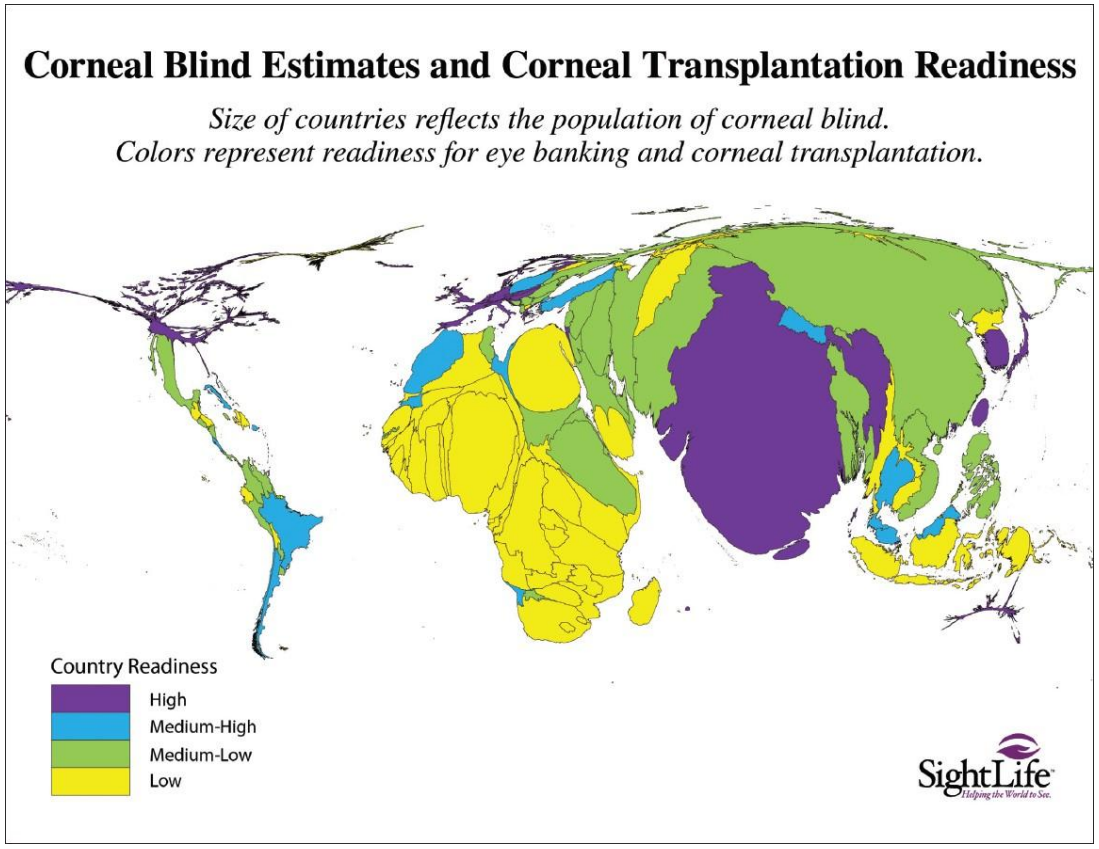
Corneal Disease Middle/low income countries

- Bilateral:
  - Xerophthalmia
  - Trachoma
  - Onchocerciasis
  - Leprosy
  - Moorens Ulcer
  - Measles
  - (Keratoconus)
- Unilateral:
  - *Microbial keratitis (trauma)*



Corneal Blindness

- Monocular blindness from corneal disease
  - Severely under-reported in blindness surveys
  - WHO:
    - Estimated 1.5-2 million new cases annually
  - Silent epidemic
    - Younger patients
    - Poor outcomes



Impact

- High Morbidity
- Painful
  - photophobia
- Protracted course
  - Expensive treatment
  - Lost work
- Poor outcome
- Poor cosmesis
- Loss of eye

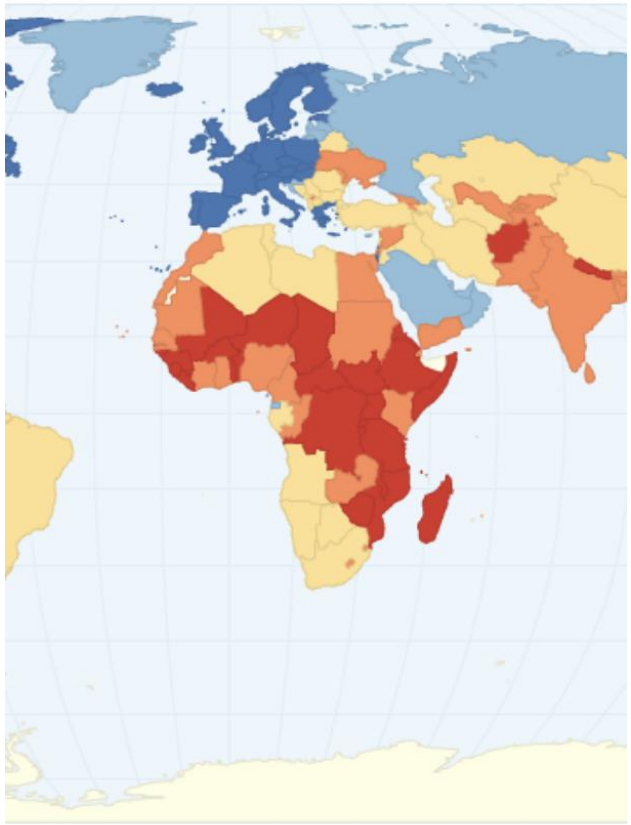


Microbial Keratitis in Developing World

- Epidemiology
- Causes
- Treatment Basics
- Challenges
- Prevention

Epidemiology Microbial keratitis –High Income Countries

- Global estimates unilateral blindness 1.5-2 million cases per year
- Rigorous data extraction difficult
- Olmsted Country USA (Erie & Co)
  - 2.5 per 100.000 1950 to 11.0 per 100.000 in 1980
  - 27.6 per 100.000(Jeng & Co 1980s)
- UK
  - 6.96 per 100.000
- Hong Kong (Lam & Co)
  - 6.3 per 100.000

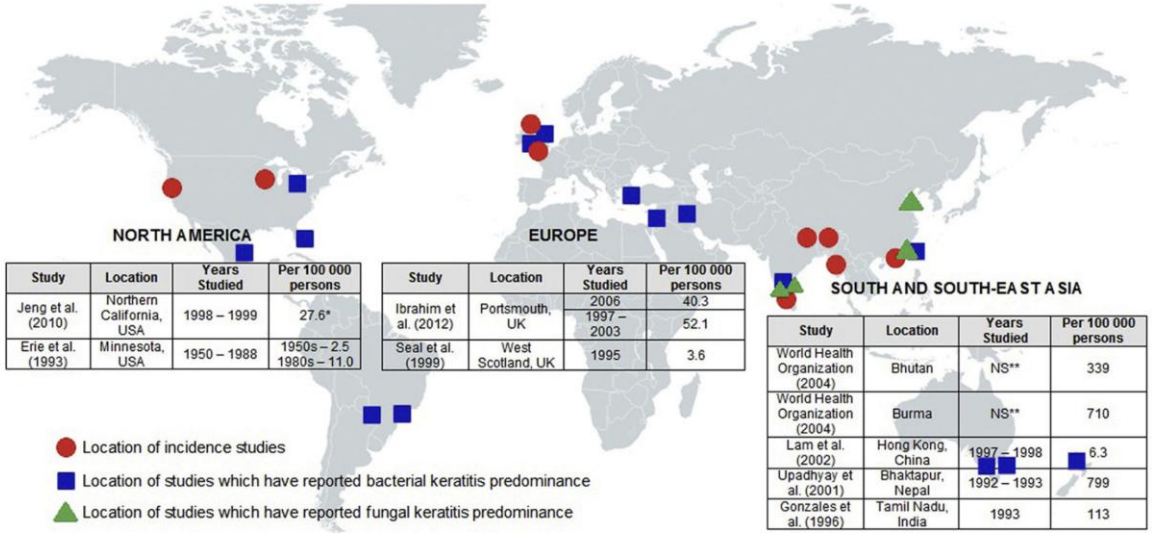


Moledina M, Roberts HW, Mukherjee A, Spokes D, Pimenides D, Stephenson C, Bassily R, Rajan MS, Myerscough J. Analysis of microbial keratitis incidence, isolates and in-vitro antimicrobial susceptibility in the East of England: a 6-year study. Eye (Lond). 2023 Sep;37(13):2716-2722. doi: 10.1038/s41433-023-02404-3. Epub 2023 Jan 28. PMID: 36709219; PMCID: PMC9883814.

Ung L, Bispo PJM, Shanbhag SS, Gilmore MS, Chodosh J. The persistent dilemma of microbial keratitis: Global burden, diagnosis, and antimicrobial resistance. Surv Ophthalmol. 2019 May-Jun;64(3):255-271. doi: 10.1016/j.survophthal.2018.12.003. Epub 2018 Dec 24. PMID: 30590103; PMCID: PMC7021355.

Epidemiology Microbial keratitis –Low & Middle Income Countries

- Tamil Nadu
  - 113 per 100.000
  - Extrapolating to all India: 800.000 cases per year
- Bhutan
  - 339 per 100.000
- Nepal
  - 799 per 100.000
- Birma
  - 710 per 100.000



Study	Location	Years Studied	Per 100 000 persons
Jeng et al. (2010)	Northern California, USA	1998 – 1999	27.6*
Erie et al. (1993)	Minnesota, USA	1950 – 1988	1950s – 2.5 1980s – 11.0

Study	Location	Years Studied	Per 100 000 persons
Ibrahim et al. (2012)	Portsmouth, UK	2006	40.3
		1997 – 2003	52.1
Seal et al. (1999)	West Scotland, UK	1995	3.6

Study	Location	Years Studied	Per 100 000 persons
World Health Organization (2004)	Bhutan	NS**	339
World Health Organization (2004)	Burma	NS**	710
Lam et al. (2002)	Hong Kong, China	1997 – 1998	6.3
Upadhyay et al. (2001)	Bhaktapur, Nepal	1992 – 1993	799
Gonzales et al. (1996)	Tamil Nadu, India	1993	113

Ung L, Bispo PJM, Shanbhag SS, Gilmore MS, Chodosh J. The persistent dilemma of microbial keratitis: Global burden, diagnosis, and antimicrobial resistance. Surv Ophthalmol. 2019 May-Jun;64(3):255-271. doi: 10.1016/j.survophthal.2018.12.003. Epub 2018 Dec 24. PMID: 30590103; PMCID: PMC7021355.

Risk Factors (here)

"High and increasingly Middle Income Countries"

- Contact lenses (22%)
- Ocular Surface Disease (18%)
- Prior Surgery (11%)
- *Debilitated patients*
- *Immunological disease (often sterile)*





Risk Factors

Low income countries



- **Ocular trauma**
  - **Agricultural work**
  - **High temp & humidity**
- Incidence of ocular injuries in agricultural societies high
  - Incidence 1.8% in Bhaktapur study;
  - Nepal Survey: 7.9% monocular blindness due to trauma
  - Previous minor trauma 25%-50% in various studies
- Warzones & Industry
- Worldwide 55 million eye injuries (WHO)

Risk Factors of Microbial Keratitis



Ocular trauma

- **Agricultural work**
- **High temp & humidity**

Delay in treatment

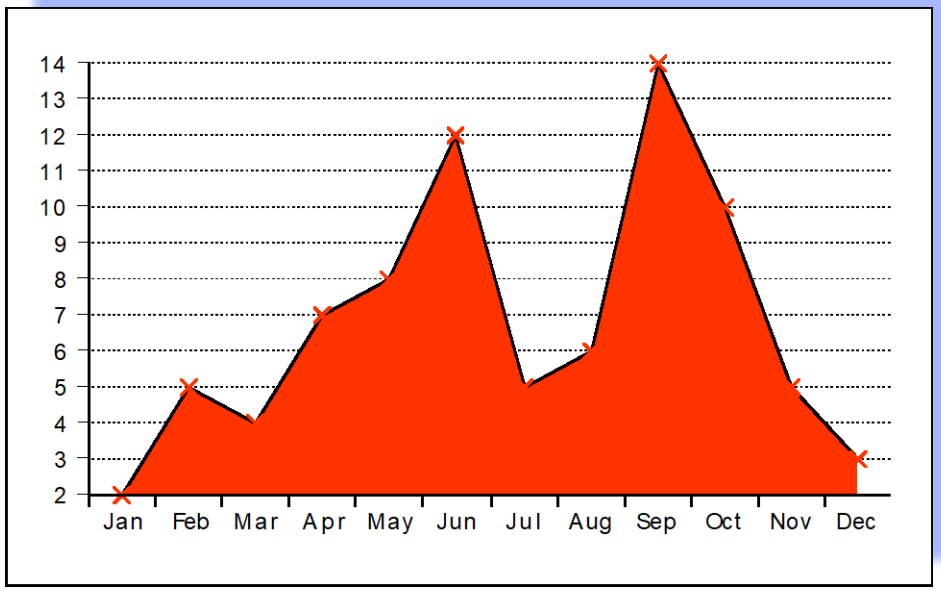
Inappropriate treatment

Under-resourced Treatment facilities

Risk Factors



- **Ocular trauma**
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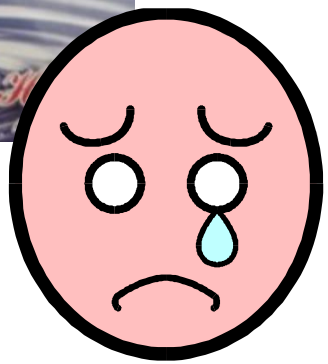
Risk Factors of Microbial Keratitis



- **Ocular trauma**
  - **Agricultural work**
  - **High temp & humidity**
- Delay in treatment
  - Distance
  - Transport
  - Reliance of Others
- Inappropriate treatment
- Under-resourced Treatment facilities

Risk Factors of Microbial Keratitis





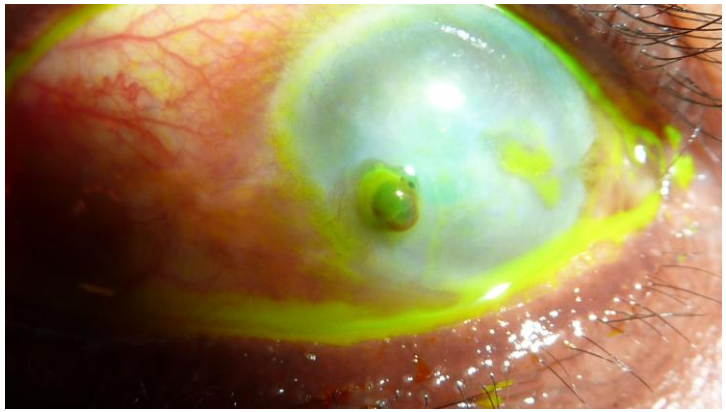
Ocular trauma
- **Agricultural work**
- **High temp & humidity**

Delay in treatment
- Distance
- Transport
- Reliance of Others

Inappropriate treatment
- **Traditional Eye Medicine**
  - Non sterile
  - Vegetative matters
  - Animal or human products

Under-resourced Treatment facilities

Traditional Eye Medicines (TEM)



- Nigeria 54.9% (Ukponmwan 2010)
- Oman 54.8% (Ragini 2009)
- Malawi 33.8% (Courtwright 1990)
- Tanzania 49% (Pragna 1999)
- Nepal 49% (Singh 2005)

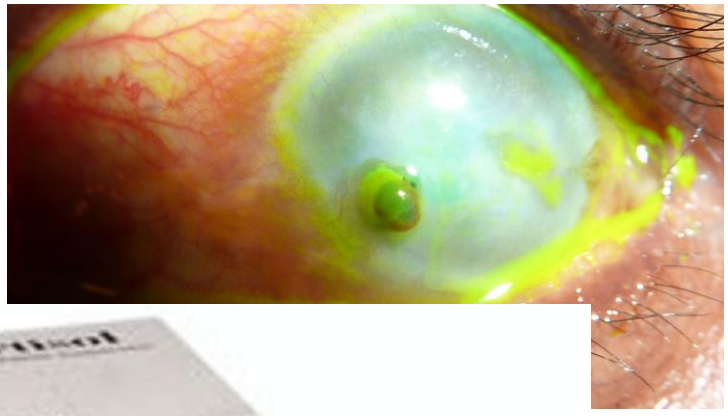
Delays
Secondary Infection
Poorer Outcomes

The types of traditional eye medications used

Types	Frequency	Percent
Plant extract	62	54.9
Concoctions	24	21.2
Breastmilk	4	3.5
Religious items	4	3.5
Lead antimony	2	1.8
Urine	2	1.8
Soot	1	0.9
Alcohol	1	0.9
Not known	13	11.5

Ukponmwan ea Incidence and complication of TEM in Nigeria in a TH Middle East Afr J Ophth 2010 17(4): 315-319

Traditional Eye Medicines (TEM)



- STEROIDS !!



Delays
Secondary Infection
Poorer Outcomes

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Risk Factors of Microbial Keratitis



Ocular trauma
- **Agricultural work**
- **High temp & humidity**

Delay in treatment
- Distance
- Transport
- Reliance of Others

Inappropriate treatment
- **Steroids**
- **Traditional Eye Medicine**
  - Non sterile
  - Vegetative matters
  - Animal or human products
  - STEROIDS

Under-resourced Treatment facilities
- Lack of staff, expertise
- Lack of Lab facilities
- Lack of appropriate medication

Aetiology

Initial defect in ocular barrier	primary/ secondary infection of cornea
Bacterial:	Pseudomonas/ Strep pneumonia, Staph aureus
Fungi:	Fusarium/ Aspergillus Rare organisms dermatiacious fungi Yeast (candida)
Acanthamoeba, Nocardia	*Rare: mycobacterium, microsporidiae*

BMC Ophthalmology (2016) 16:209

Aetiology

- Africa
  - Fungus 37%
    - Fusarium 40%
    - Aspergillus 17%
  - Bacterial 12%
    - Pseudomonas 52%
    - Streptococci 20%
    - Staphylococci 10%
  - Acanthamoeba 0.3%

- India
  - Fungus 39%
    - Fusarium 40%
    - Aspergillus 22%
  - Bacteria 23%
    - Streptococci 43%
    - Staphylococci 26%
    - Pseudomonas 15%
  - Acanthamoeba 0.9%

Aetiology of suppurative corneal ulcers in Ghana and south India

AK Leck et al British J Ophth 2002;86:1211-1215

Aetiology

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Aetiology

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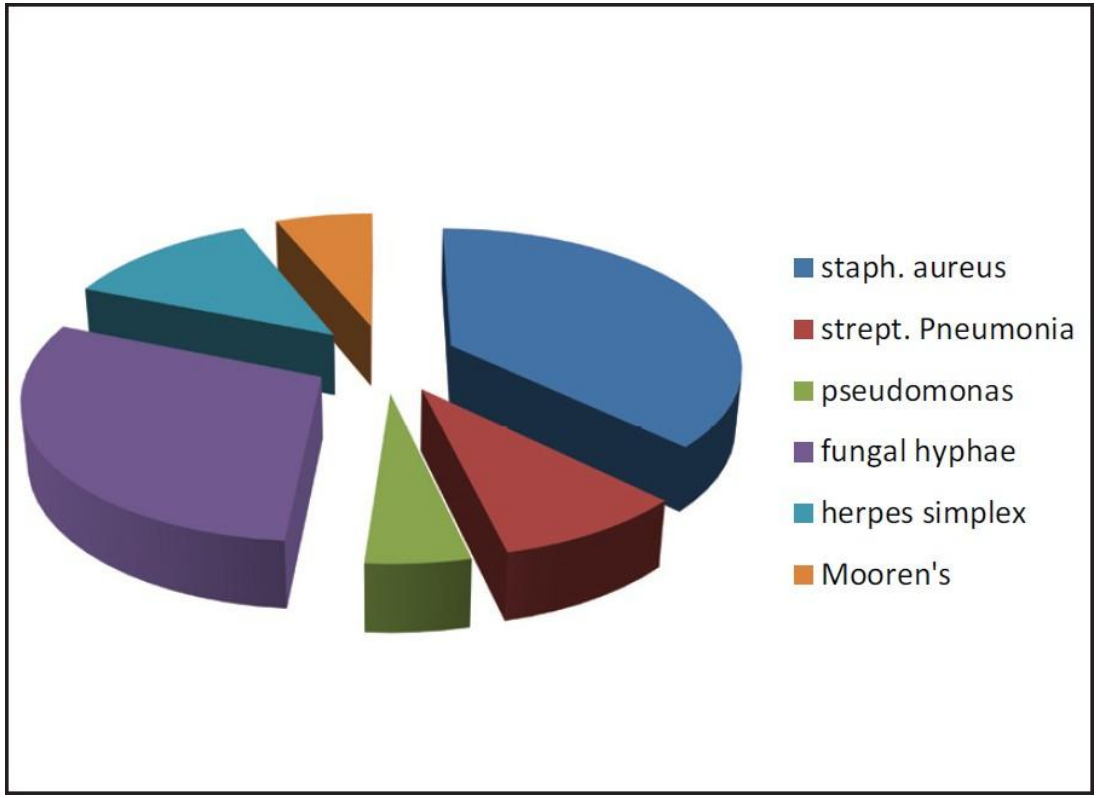
- India
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    - Fusarium 40%
    - Aspergillus 22%
  - Bacteria 23%
    - Streptococci 43%
    - Staphylococci 26%
    - Pseudomonas 15%
  - Acanthamoeba 0.9%

- UK
  - 42% culture proven
  - 87% bacterial
  - 2.4% poly-organism
  - 9.3% fungi 1% acanthamoeba

Moledina M, Roberts HW, Mukherjee A, Spokes D, Pimenides D, Stephenson C, Bassily R, Rajan MS, Myerscough J. Analysis of microbial keratitis incidence, isolates and in-vitro antimicrobial susceptibility in the East of England: a 6-year study. Eye (Lond). 2023 Sep;37(13):2716-2722. doi: 10.1038/s41433-023-02404-3. Epub 2023 Jan 28. PMID: 36709219; PMCID: PMC9883814.

Oladigbulu (Nigeria 2013)

- Trauma 52%
- TEM 17%
  - delays
- Steroids 5.7%
- Measles 4%



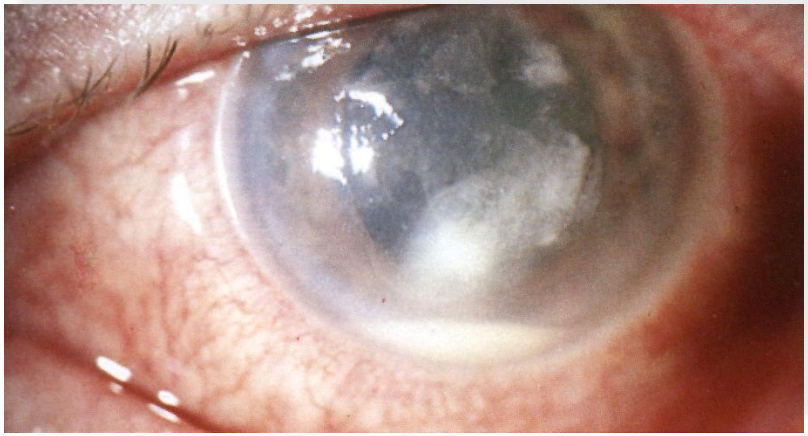
Oladigbulu ea Corneal Ulcers in Tertiary Hospital in Northern Nigeria Annals of African Medicine 2013;12(3):165-170

Clinical Presentation



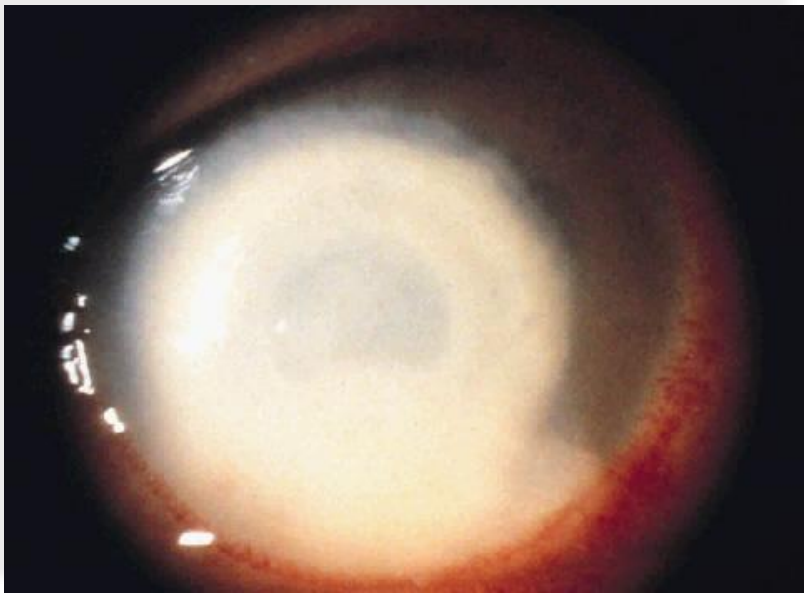
- History of trauma
- Painful red eye
- Photophobia
- Discharge
- Loss of vision

Gram Positive



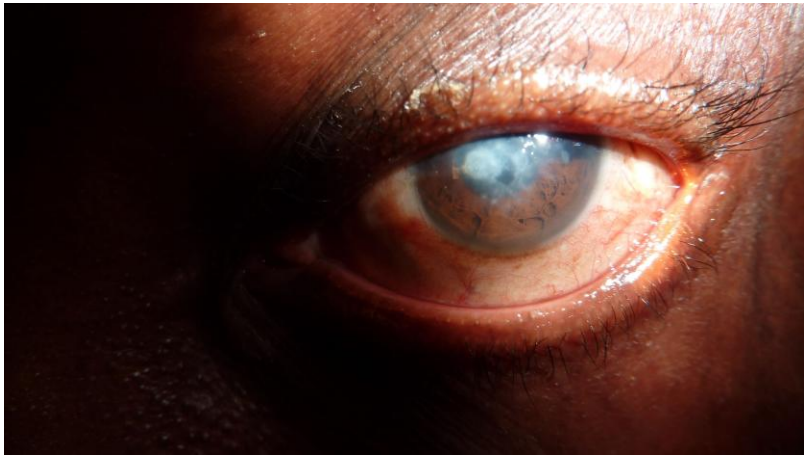
- Strep Pneumoniae
- Deep Central Oval Ulcer
- Dense stromal abscess
- Hypopyon
- Fibrin deposition
- Tearduct Obstruction

Gram Negative



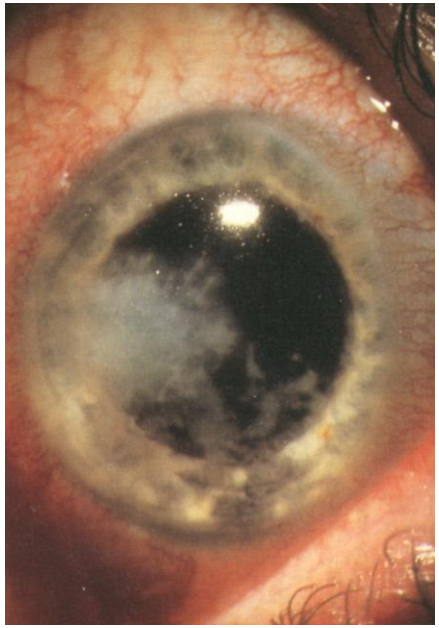
- Pseudomonas
- Rapidly progressive
- Broad central ulcer
- Copious mucopurulent exudate
- Large hypopyon
- Surrounding cornea opaque
- Early perforation

Fungal Keratitis



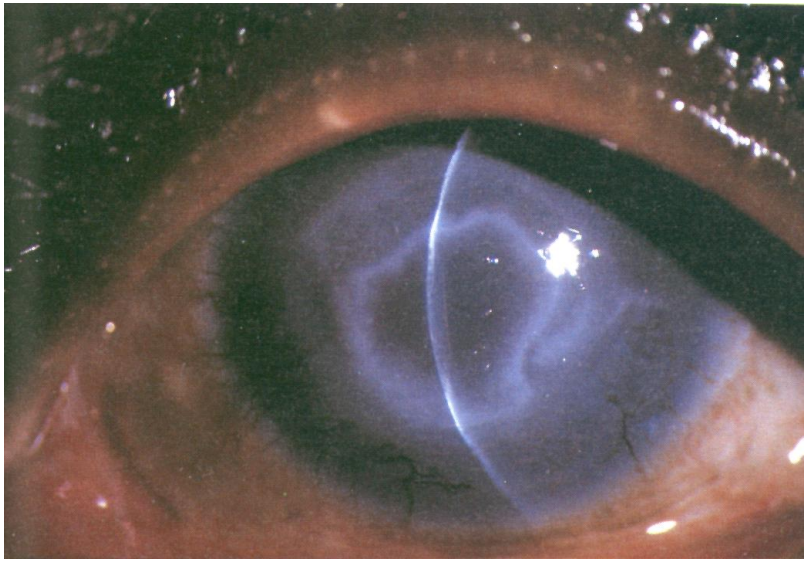
- High Index of suspicion
- Vegetative matter
- Steroid Use
- More insidious onset
- Less fulminant to start

Fungal Keratitis



- Dry elevated plaque-like infiltrate
  -pigmented (rarer dermatiacous fungi)
- Feathery with Satellite lesions
- Less injection & chemosis
- Remaining cornea clear
- Hypopyon maybe late feature (sticky non mobile)
- Late stages:
  - Secondary glaucoma
    Endophthalmitis

Acanthamoeba
in low income countries



Trauma
Not associated with CL
Pain not major feature
No radial neuro-keratitis
Trauma or mud splash
Ring ulcer
Protracted course

Management (secondary care)

Difficult

Long term intensive treatment

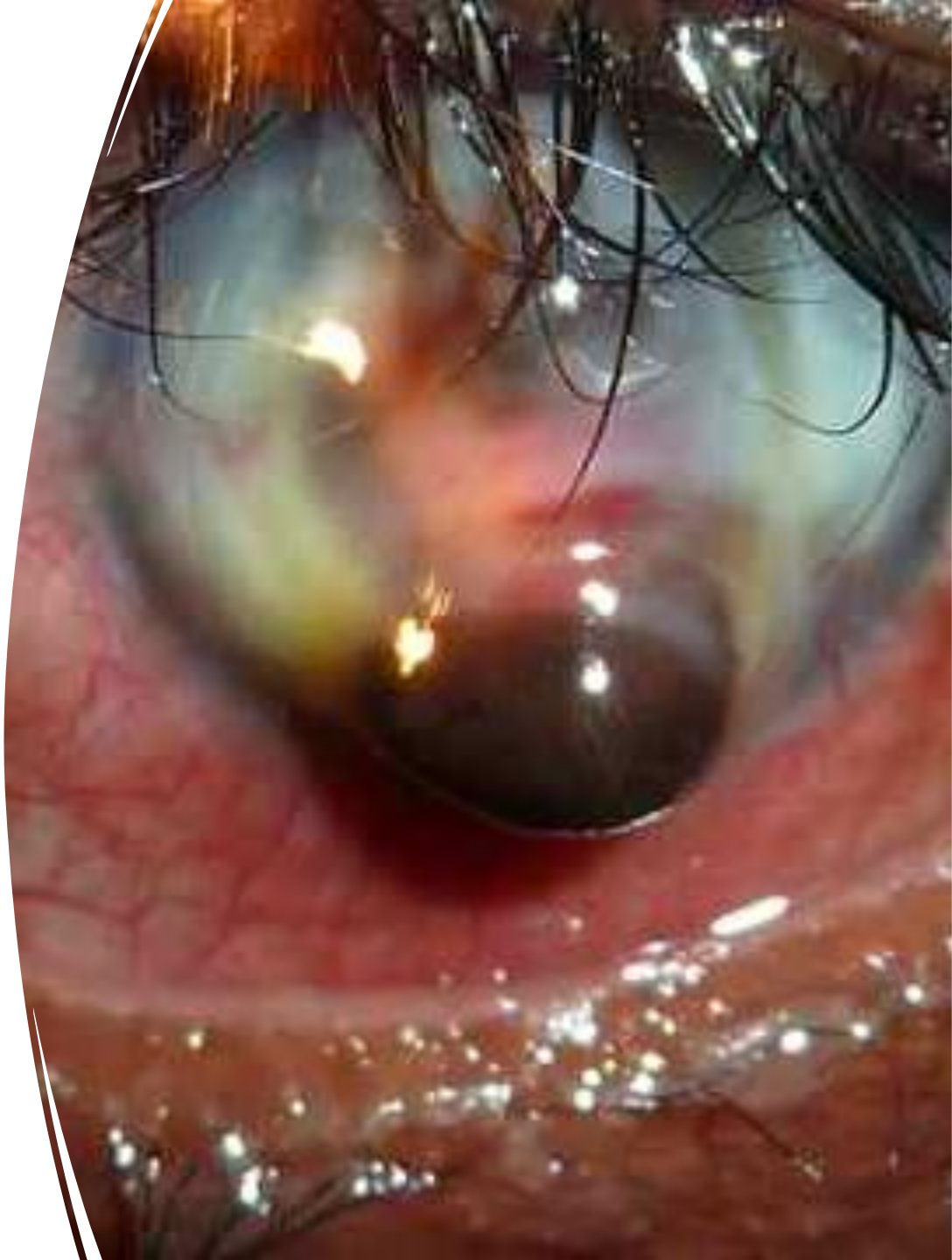
- Cost implication (expensive medication, can't work, hospital admission)

Poor prognosis

- Vision reduced even in successful treatment
- Poor cosmesis (big white scar)
- High evisceration rate in fungal ulcers 15-20%

Aim

- Fast resolution of disabling symptoms
- Reduction in size of scar
- Prevention of complications, in particular perforation



Admission





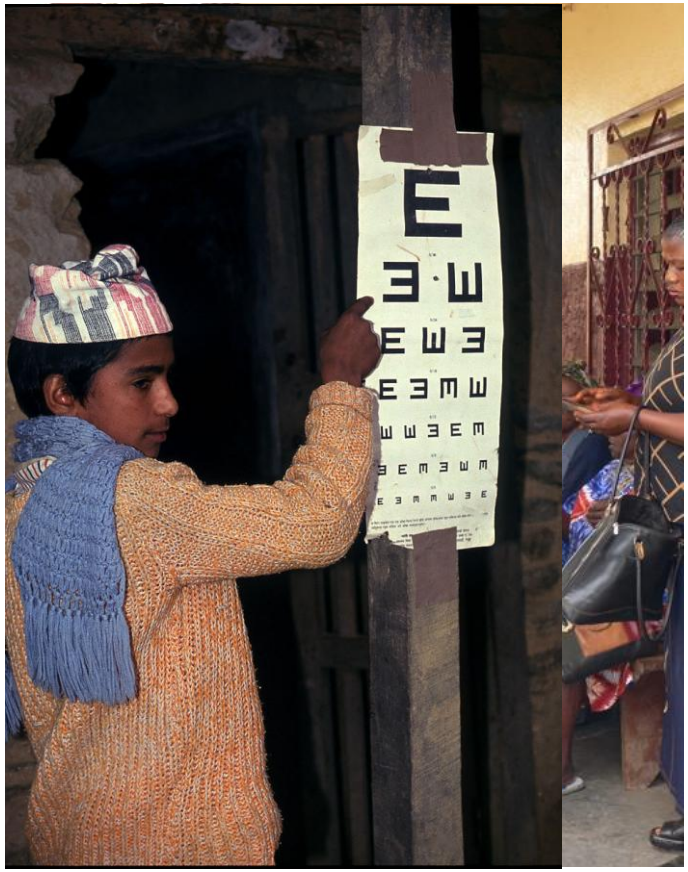
All severe ulcers

- Adherence to intensive treatment schedule
- Allow follow up
- Threat to vision
- Reduction travel cost
- (free food)
- Income situation?

Isolation

- Separate septic ward

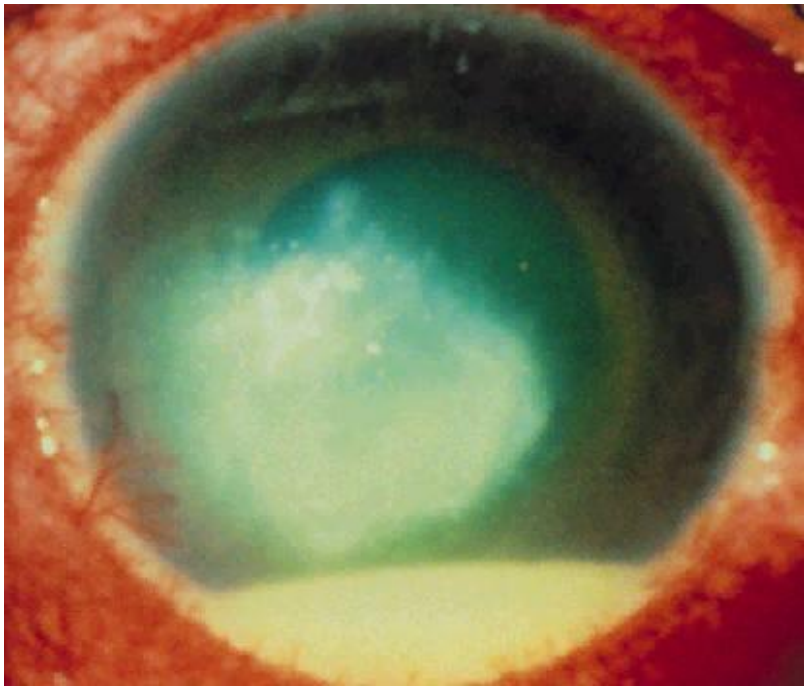
Baseline Assessment



- Pain
  - Severity
  - Photophobia
  - Guide to improvement
- Vision

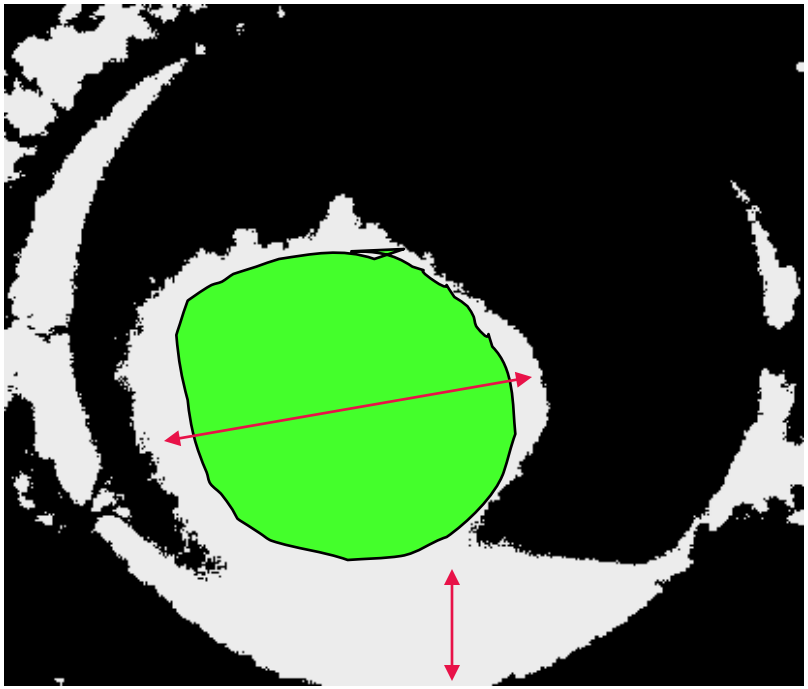


Baseline Assessment



- Pain
- Vision
- Baseline Record
  - Extent of Epithelial Defect
  - Extent of Infiltrate
  - Height of Hypopyon

Baseline Assessment



- Pain
- Vision
- Baseline Record
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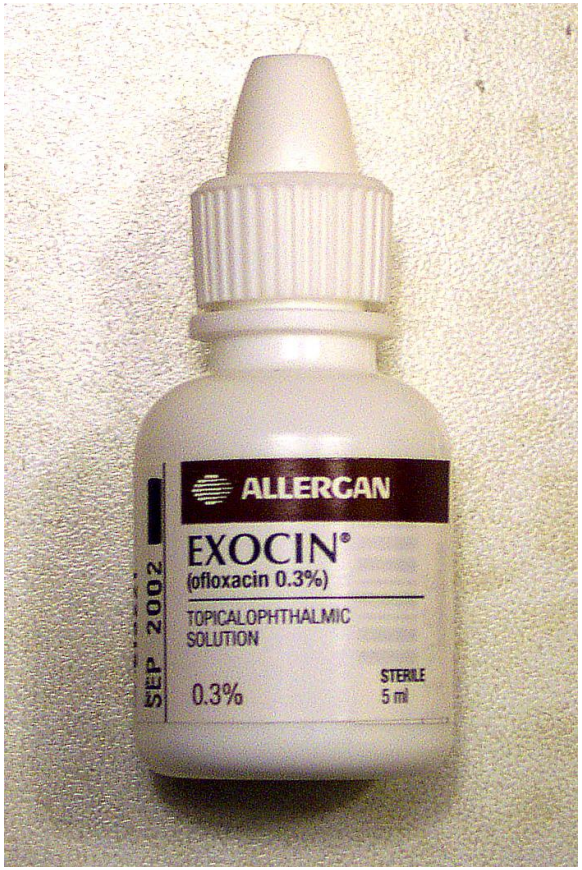
Investigations

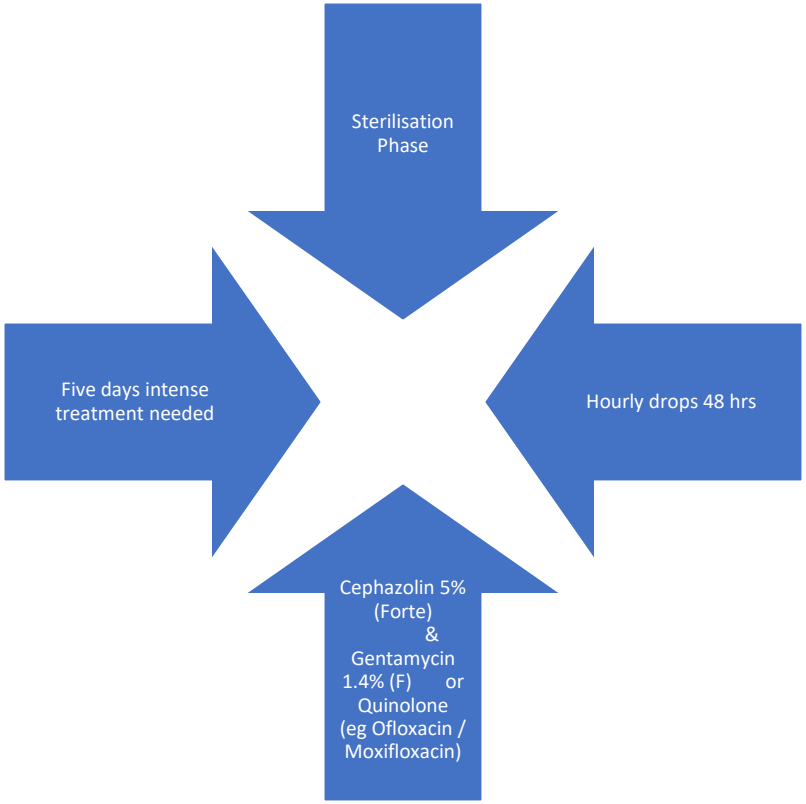


- Corneal scraping
  - Gram slide
  - KOH
  - Giemsa
  - Lactophenol Blue
- Culture & sensitivity

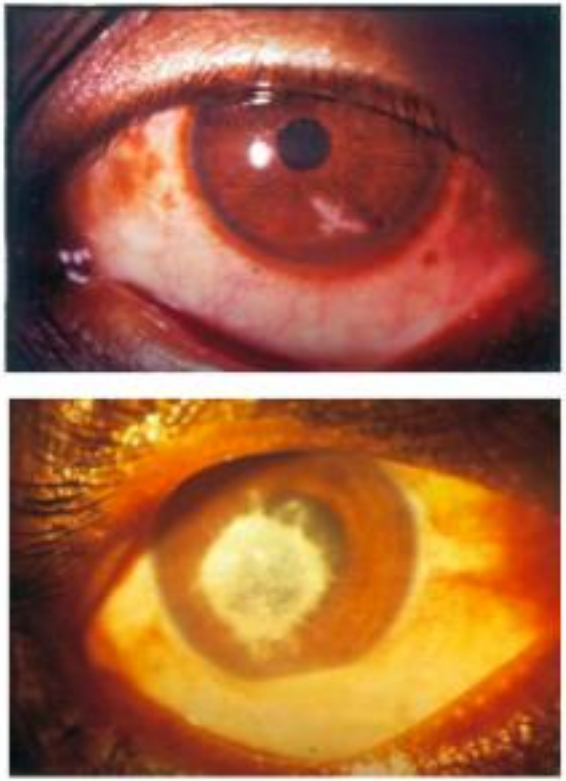


Intensive Treatment (Suspected Bacterial Keratitis)



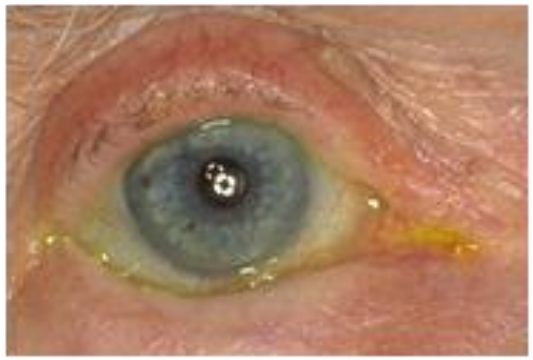


Intensive Treatment
(Fungal hyphae seen or suspected fungal ulcer)



- Natamycin 5% hourly
- Alternative:
  Amphoteracin B
  Voriconazole
- Prolonged treatment
- Debridement/ epithelial scrape

Additional Measures



- Correct trichiasis/ entropion
- Check Lacrimal Sac
- Lid Hygiene
- Cut eye lashes

- Doxycycline (anti collagenase)
- Systemic antibiotics (Ciprofloxacin 750 mg BD)
- Oral Voriconazole in Fungal keratitis (controversial)

Additional Measures

- Correct trichiasis/ entropion
- Check Lacrimal Sac
- Lid Hygiene
- Cut eye lashes

- For Children:
- Vitamin A Status



Improved

Not Improved

- Reduce intensity
- After five days promote healing:
- Lubrication
- Stop toxic drugs



Improved

- Reduce intensity
- After five days promote healing:
- Lubrication
- Stop toxic drugs

Not Improved

- Change treatment
- Add antibiotics
  - Monotherapy to combined
- Polymicrobial?
- **Consider anti-fungal at early stage**

Anti-Fungal Treatment

- Poor (bio)availability of ocular anti-fungal
- Imidazoles: Clotrimazole / Ketoconazole
  - Not as monotherapy against Fusarium
- Polyenes: Amphotericin B / Natamycin
  - Fusarium / Aspergillus
- Alternatives: Voriconazole, Chlorhexidine
- Dermatological ointments (diluted)
- Poor penetration
  - Debridement helps
  - Miconazole / Fluconazole has better penetration (but relatively poor activity)

Anti-Fungal Treatment

- Topical Natamycin more effective than topical Voriconazole
  - Fusarium
  - Non Fusarium equal
- Voriconazole in rarer fungi
  - Additional oral voriconazole (limited role in Fusarium)
  - (Amphoterecin B)
- Targeted intrastromal/ intracameral (Voriconazole, AMP-B)
- Rose Bengal Photo-dynamic Therapy
  - Limited clinical evidence
- Topical Systemic Targeted TST Protocol
  - guidelines

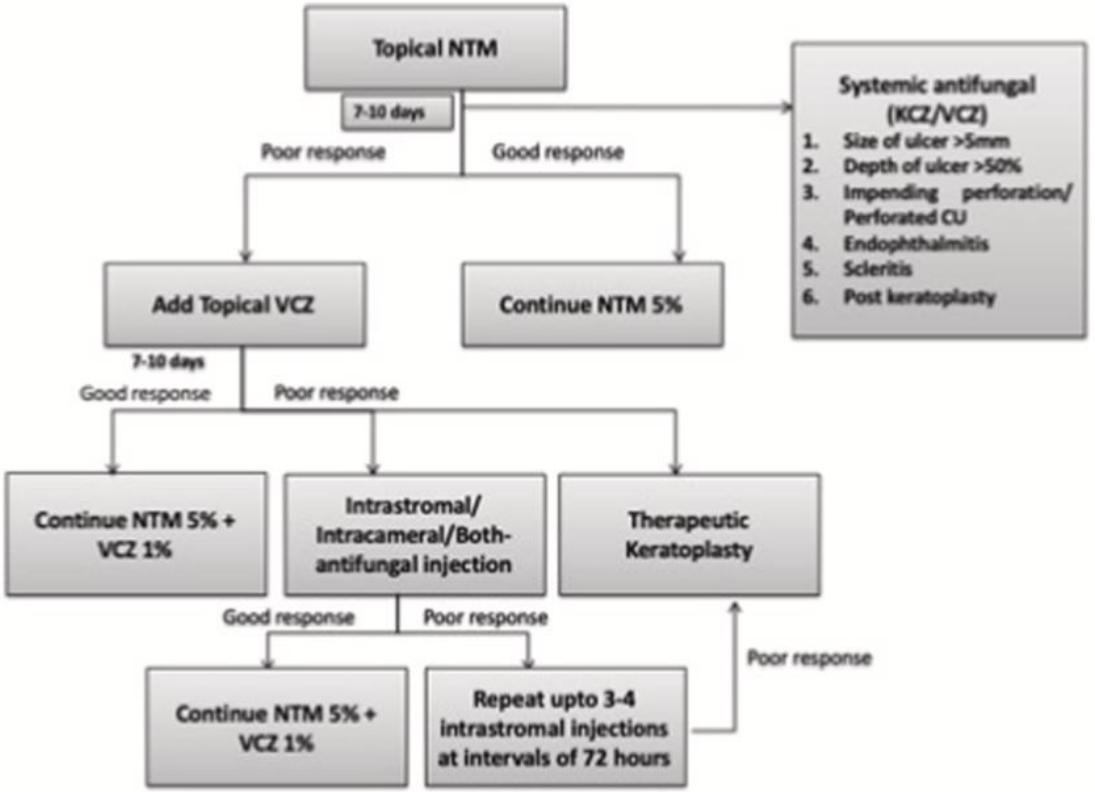


Fig. 4. Figure showing the topical-systemic-targeted (TST) protocol for the management of fungal keratitis.

MUTT 1 & MUTT 2



- Natamycin superior for Fusarium

- *In fungal corneal ulcer cases with filamentous fungal keratitis, particularly the Fusarium species, patients treated with natamycin had a better outcome than those treated with voriconazole. The difference in outcome in other species were not significant. Voriconazole should not be used as mono- therapy in the treatment of Fusarium keratitis.*

- MUTT 2: slight benefit from adding oral Voriconazole to topical Natamycin in cases of Fusarium
  - Sl reduction of rate of perforation
  - Sl reduction in size of scar

Prajna NV, Mascarenhas J, Krishnan T, et al. **Comparison of natamycin and voriconazole for the treatment of fungal keratitis.** Arch Ophthalmol 2010;128:672-8.

Predictors of Corneal Perforation or Need for Therapeutic Keratoplasty in Severe Fungal Keratitis: A Secondary Analysis of the Mycotic Ulcer Treatment Trial II.
Prajna NV e.a.JAMA Ophthalmol. 2017 Sep 1;135(9):987-991.

SCUT

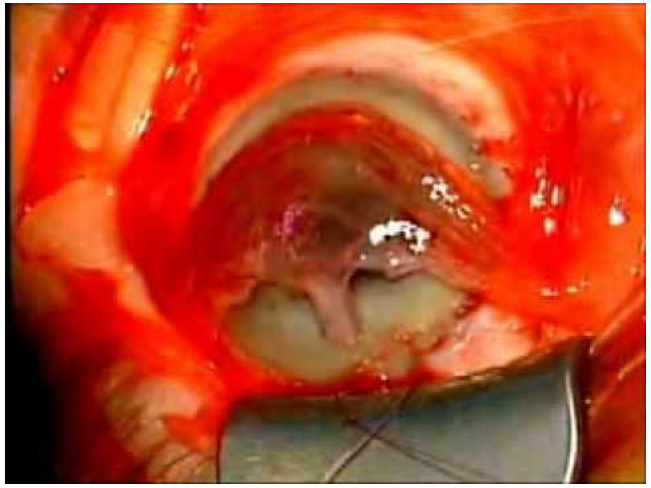
- SCUT
  - Topical steroids generally safe for culture proven bacterial keratitis except Nocardia after 48 hrs of
  - Intense antibiotics
  - Probably less safe in Fungal keratitis / acanthamoeba



Srinivasan M, Mascarenhas J, Rajaraman R, Ravindran M, Lalitha P, O'Brien KS, Glidden DV, Ray KJ, Oldenburg CE, Zegans ME, Whitcher JP, McLeod SD, Porco TC, Lietman TM, Acharya NR; **Steroids for Corneal Ulcers Trial Group. The steroids for corneal ulcers trial (SCUT):** secondary 12-month clinical outcomes of a randomized controlled trial. Am J Ophthalmol. 2014 Feb;157(2):327-333.e3. doi: 10.1016/j.ajo.2013.09.025. Epub 2013 Oct 1. PMID: 24315294; PMCID: PMC3946996.

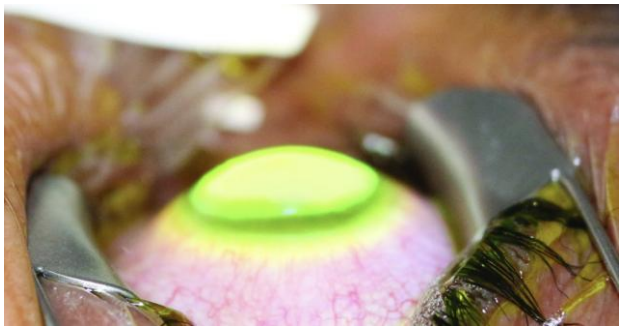
Non responding Cases

- **Indolent non infective Ulcer (PED)**
  - **Promote healing**
    - **Tear drops**
    - **Stop aggressive antibiotics**
    - **Ointments**
  - **Tarsorraphy**
  - **(Botox)**
  - **Conjunctival flap (Gunderson)**
  - **AMT**



PACK CXL

- Photo Activated Chromophore for Keratitis
- Accelerated High Fluence Protocols
- Dresden protocol not as effective

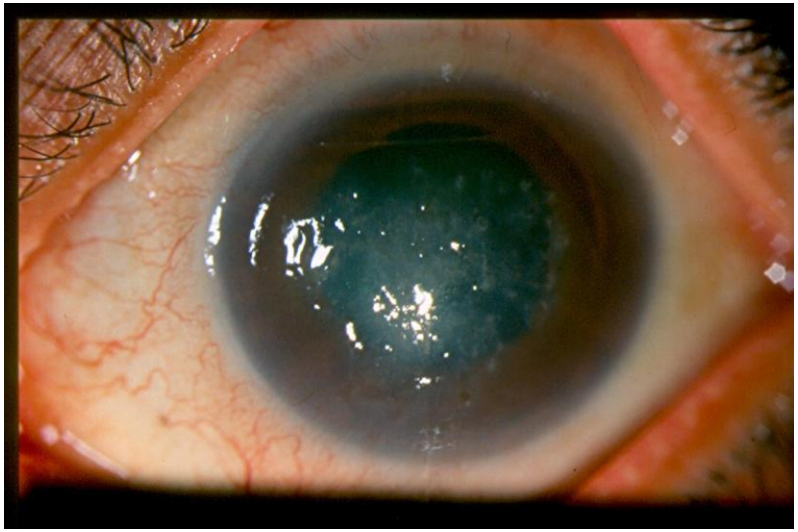


Chan TC, Agarwal T, Vajpayee RB, Jhanji V. Cross-linking for microbial keratitis. Curr Opin Ophthalmol. 2016 Jul;27(4):348-52.

Saini S, Singh S, Dwivedi K, Singh S, Kumar S, Rana J. Photo-activated chromophore for infectious keratitis cross-linking and its efficacy as a treatment modality in managing microbial keratitis. Indian J Ophthalmol. 2022 May;70(5):1571-1577

Non responding Cases

- **Consider alternative causes :**
  - **Polymicrobial**
    - **Fungus & Bacterial**
    - **Unusual Organisms**
    - **Mycobacterium (non TB)**
    - **Nocardia**
      - **Amikacin**
    - **Microsporidiae**
      - **Stromal keratitis**
      - **?Chlorhexidine / Fumagillin**
  - **HSK (Stromal)**
  - **HIV / DM**
  - **Mooren Ulcer**
  - **Auto-immune disease (PUK)**



Alkatan HM, Al-Zaaidi S, Athmanathan S. Microsporidial keratitis: Literature review and report of 2 cases in a tertiary eye care center. *Saudi J Ophthalmol*. 2012;26(2):199–203. doi:10.1016/j.sjopt.2012.02.007

Gieger A, Waller S, Pasternak J. Nocardia Arthritidis Keratitis: Case Report and Review of the Literature. Nepal J Ophthalmol. 2017 Jan;9(18):91-94

HIV

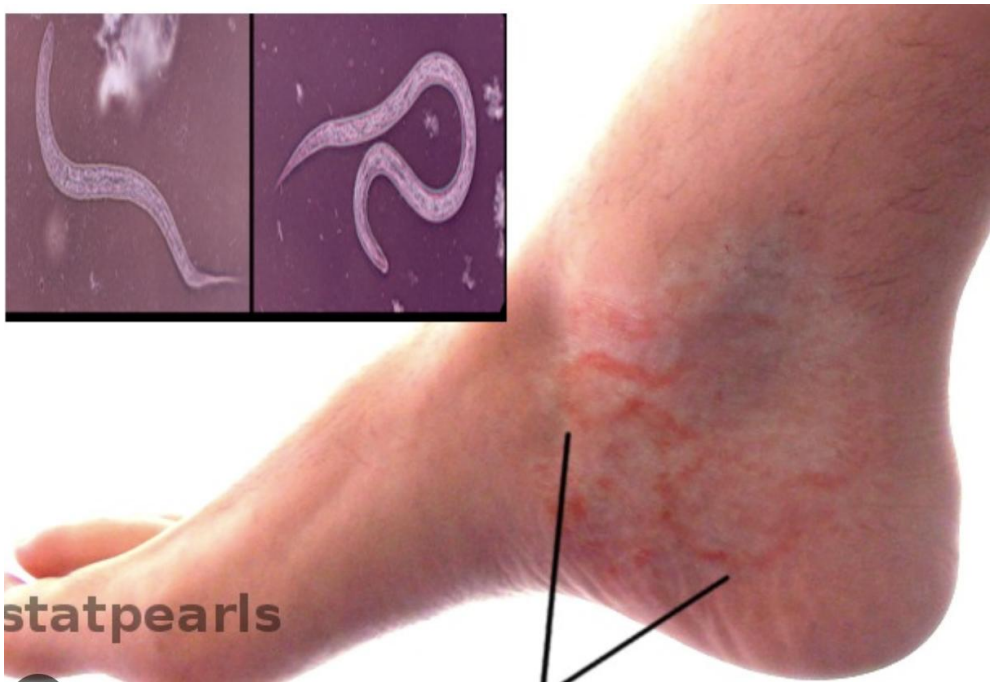
- Case Reports and non comparative series
- Possible increased risk (?)
  - 16% of ulcer patients HIV pos in Tanzania (x2 general population)
- Poorer recovery (?)
- Herpes Simplex / Zoster
- Microsporidiae (keratoconjunctivitis)
- PUK
- (limbal tumours)



Microbial Keratitis in East Africa: why are the outcomes so Poor? Matthew J. Burton e.a. Ophthalmic Epidemiol . 2011 August ; 18(4): 158–163

Mooren's Ulcer

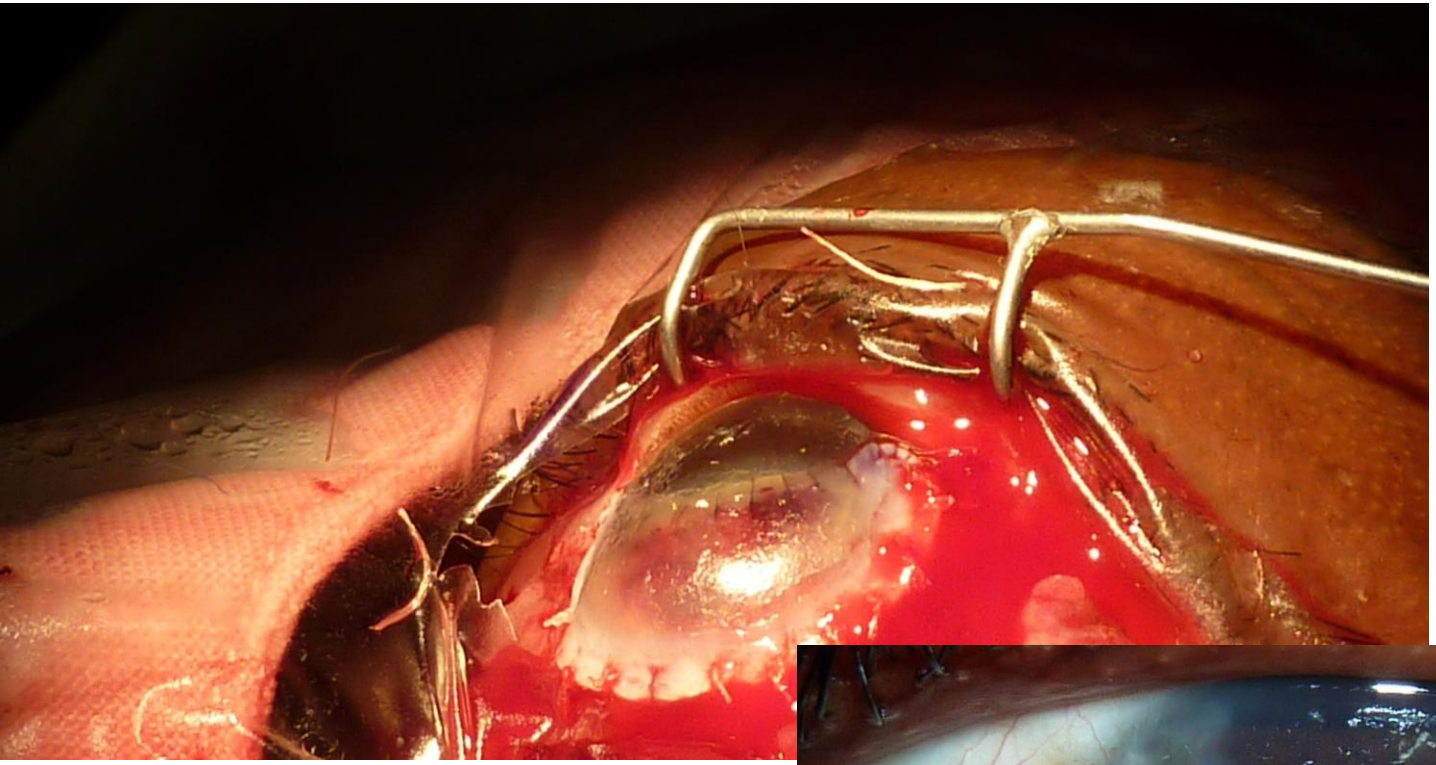
- Not Uncommon in Africa & South Asia
- Painful PUK
- No underlying disease
- Possible immunological aetiology
  - Hookworm infestation
- Bilateral in 50%
- Perforation occurs in 10-30%

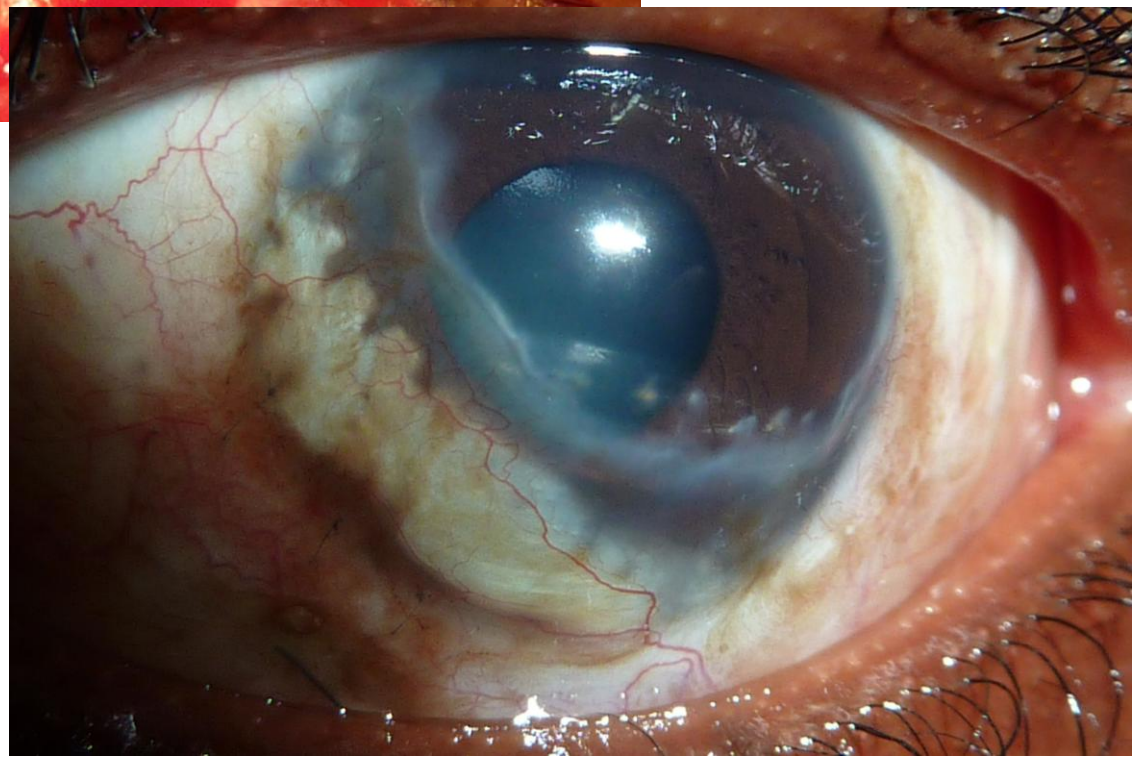


Mooren's ulcer

- Circumferential thinning of cornea
  - Involving limbus
  - Absence of scleritis
  - Steep overhanging edge
  - Vascularisation & scarring
- Treatment
  - Difficult
  - Conjunctival recession
  - Immunosuppression
  - Anti-worm treatment
  - ??Acetylcysteine
  - Glueing, patch grafts
  - AMT?

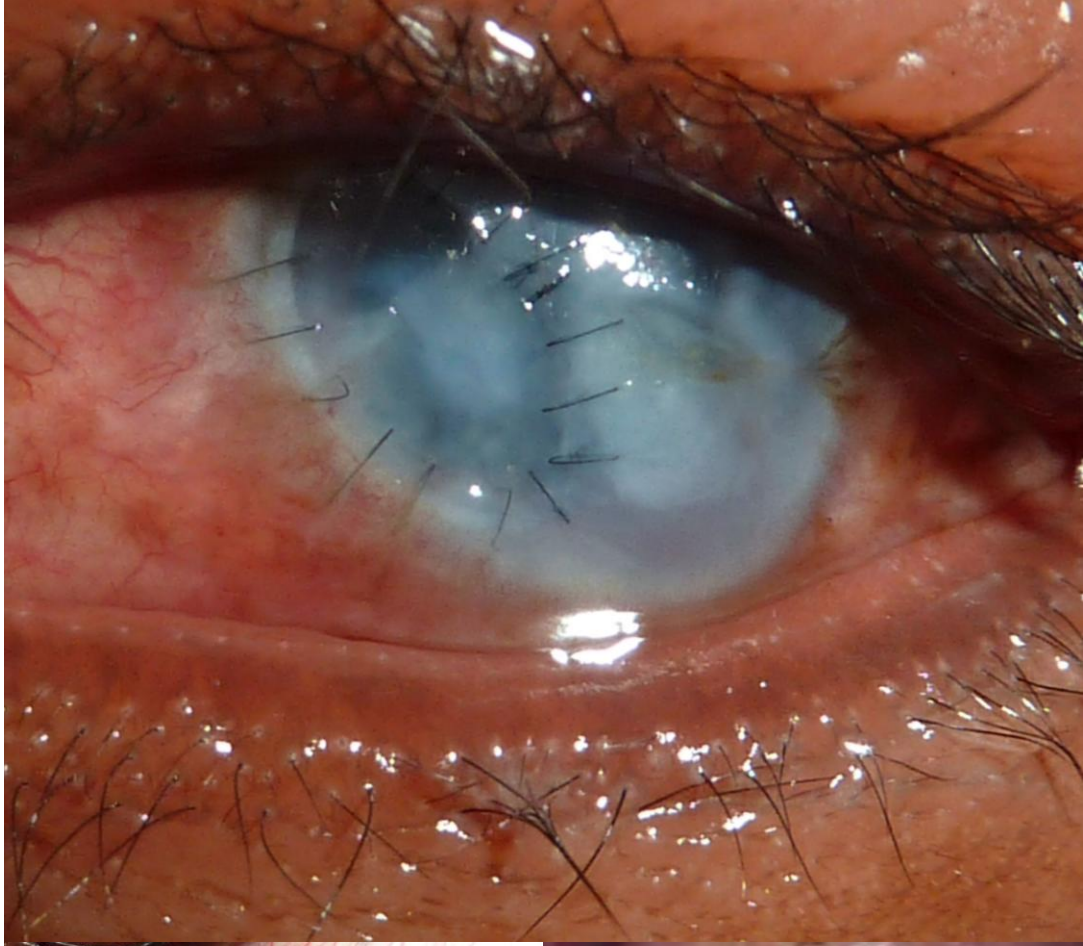


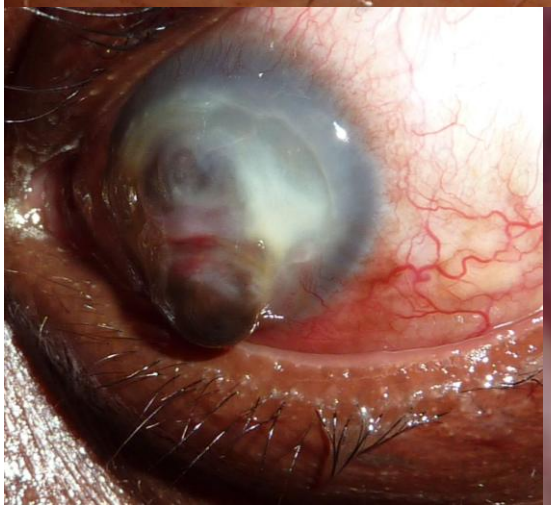




Perforation

- Riskfactors:
  - Treatment delay
  - Lower socio-economic status
  - TEM
  - Central location of ulcer
  - (Monotherapy)
- ? Tarsorraphy
- ? glue







Challenges

- Resource poor environment
- Availability of eye medication
  - Lots available commercially
    - Quinilones
    - Natamycin
    - Resistence?
- Kitchen pharmacy?
    - Manufacturing own eye drops
    - IV strength antibiotics
      - Cefuroxime 5%
      - Gentamycin 1.5%
      - Povidon Iodine
      - Chlorhexidine



Working in low income countries– Resource Management



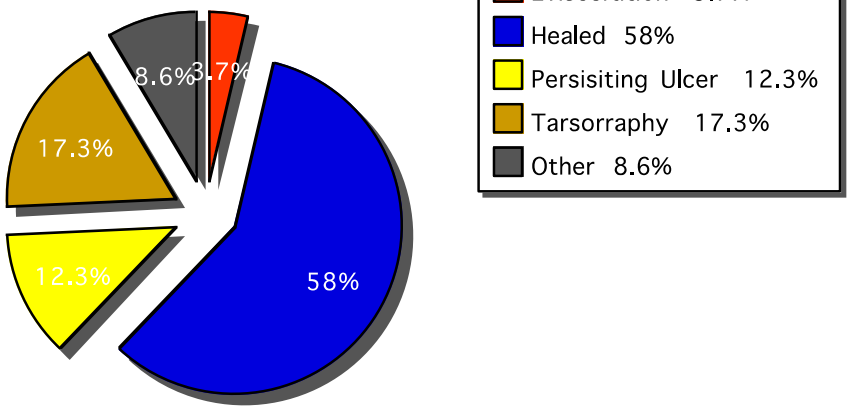
Limited prognosis

Realistic expectation

Treat patient not eye

- Treatment is costly
- Benefit to patient?
- Early evisceration?

Outcomes



Source: Himalaya Eye Hospital 1997

- Gangopadhyay N, Daniell M, Weih L, Taylor HR. **Fluoroquinolone and fortified antibiotics for treating bacterial corneal ulcers.** Br J Ophthalmol. 2000 Apr;84(4):378-84. doi: 10.1136/bjo.84.4.378. PMID: 10729294; PMCID: PMC1723447.

- Enucleation: 2-7.4%
- Perforation: 0-9.3%
- PED: 0-6%
- Healed 53%
  - Good VA on pres. all did well (6/18 or better)
  - Poor VA on pres (<6/18) 5-31% improved

- **Microbial Keratitis in East Africa: why are the outcomes so Poor?** Matthew J. Burton e.a. Ophthalmic Epidemiol . 2011 August ; 18(4): 158–163

- 25% fungus
- 66% < 6/60
- 30% perforation
- 8% evisceration

-Oladigbulu (Nigeria 2013): TEM & Fungal had poorest prognosis (25% evisceration rate)

-Microbial Keratitis in East Africa: why are the outcomes so Poor? Matthew J. Burton e.a. Ophthalmic Epidemiol . 2011 August ; 18(4): 158–163

Prevention



- Primary prevention
  - Education
  - Awareness
  - Protection

Secondary Prevention

- Nepal data:
  - 50% ocular trauma seen in primary eye care unit
  - 40% non-ophthalmic unit/ local pharmacy
  - 10% treated at home/ local practitioners

The epidemiology of ocular trauma in rural Nepal

SK Katry et al British J Ophth 2004;88:456-460

Secondary Prevention

- Bhaktapur Study:
  - 96% (424) of treated abrasion healed
  - All abrasion treated within 18 hrs healed
  - 3.7% (4) abrasions presenting 18-24 hrs infected
  - 28% (14) abrasions presenting >24 hrs infected



- ***The Baktapur eye study: ocular trauma and antibiotic prophylaxis for the prevention of corneal ulceration in Nepal*** *MP Upadhaya et al British J Ophth 2001:85:388-392*

Secondary Prevention

- Training of primary health worker
  - Non-ophthalmologist
  - Local pharmacist
  - Traditional healer
- Availability of antibiotics
  - Chloramphenicol
  - BAK and chloramphenicol have some anti-fungal activity (BJO 2009)
- Discourage use of topical steroids and other harmful eye practices

Treatment Protocol at primary level of eye care

Guidelines for the Management of Superficial Corneal Trauma and Infections in Primary Health Facilities

History and examination

If there is a:

- history of superficial injury; **and/or**
- examination shows a corneal abrasion

Treat

with chloramphenicol, eye ointment (0.5 - 1%)three times per day for at least 3 days.

- Do not use any medicine containing steroids.
- Do not use traditional medicines.

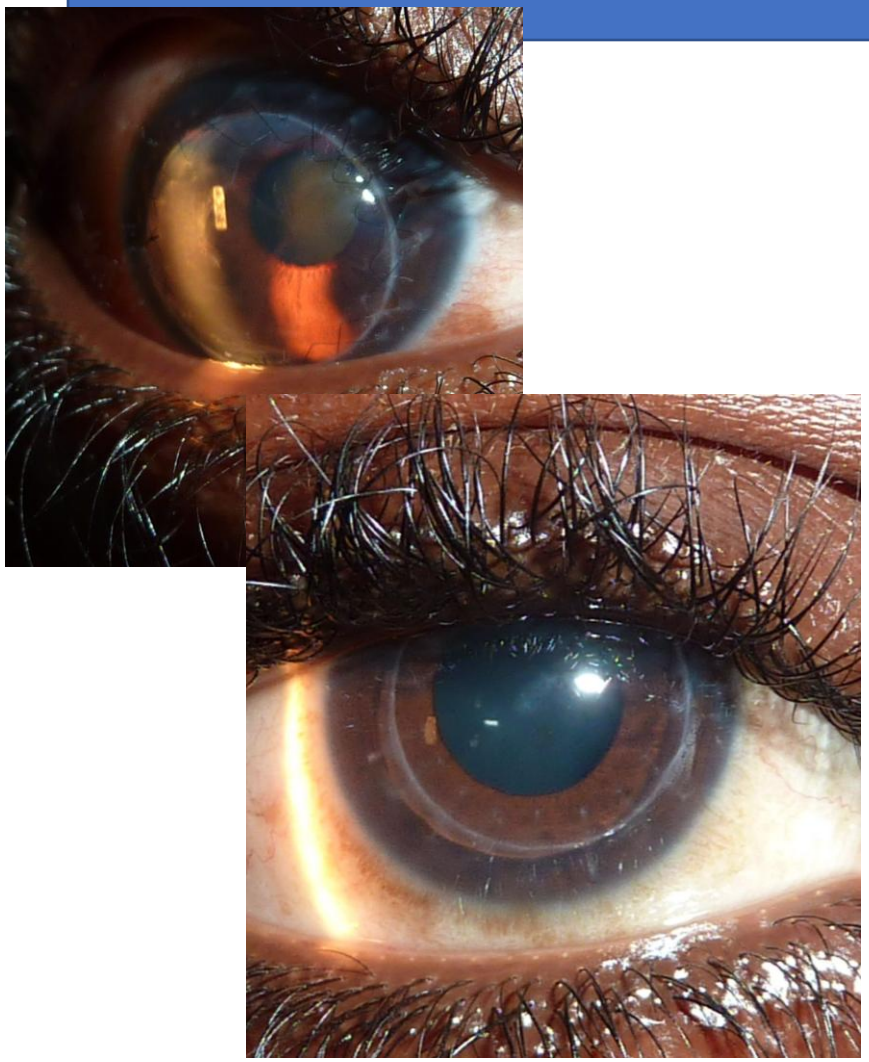
Refer to an ophthalmologist

- if pain and redness persist for 3 days; **or**
- if there is a white mark on the cornea and a red eye (corneal ulcer).

Give the patient chloramphenicol ointment to use 3 times per day when you refer to an ophthalmologist or to the nearest eye care facility.

Do not delay the referral of a patient with corneal ulcer.

Rehabilitation (tertiary prevention)



- Keratoplasty
  - Outside urban centres problematic
  - Availability graft material
  - Follow up
  - Visual outcome not always ideal
  - Reserved for bilateral blindness

Relevant Recent Literature

- Maharana, P., N. Sharma, R. Nagpal, V. Jhanji, S. Das and R. Vajpayee (2016). "**Recent advances in diagnosis and management of Mycotic Keratitis**." Indian Journal of Ophthalmology **64**(5): 346-357.

- Austin A, Lietman T, Rose-Nussbaumer J. **Update on the Management of Infectious Keratitis**. *Ophthalmology*. 2017;124(11):1678–1689. doi:10.1016/j.ophtha.2017.05.012

- Ni N, Srinivasan M, McLeod SD, Acharya NR, Lietman TM, Rose-Nussbaumer J. **Use of adjunctive topical corticosteroids in bacterial keratitis**. *Curr Opin Ophthalmol*. 2016;27(4):353–357. doi:10.1097/ICU.0000000000000273

- Ung L, Bispo PJM, Shanbhag SS, Gilmore MS, Chodosh J. **The persistent dilemma of microbial keratitis: Global burden, diagnosis, and antimicrobial resistance.** Surv Ophthalmol. 2019 May-Jun;64(3):255-271. doi: 10.1016/j.survophthal.2018.12.003. Epub 2018 Dec 24. PMID: 30590103; PMCID: PMC7021355.

- Sharma N, Bagga B, Singhal D, Nagpal R, Kate A, Saluja G, Maharana PK. **Fungal keratitis: A review of clinical presentations, treatment strategies and outcomes.** Ocul Surf. 2022 Apr;24:22-30. doi: 10.1016/j.jtos.2021.12.001. Epub 2021 Dec 13. PMID: 34915188.


ChatGPT

ASK AI



What is the extent of the problem of infectious keratitis in Africa?

ASK AI

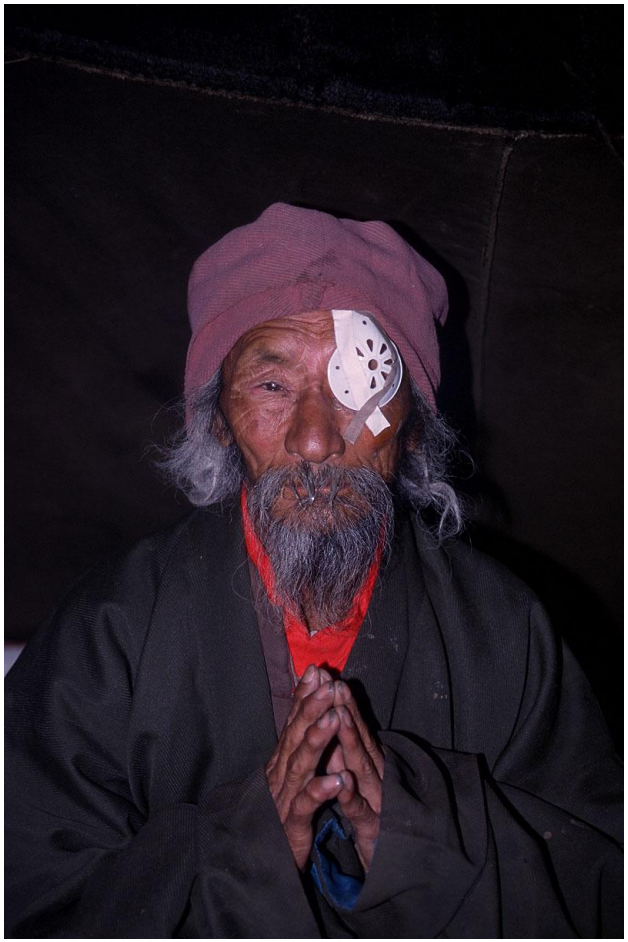


Infectious keratitis is a significant cause of ocular morbidity and blindness in Africa, with varying prevalence across the continent. Fungal keratitis, in particular, is notably prevalent in tropical regions and among agricultural communities. For instance, in Nigeria, the prevalence of fungal keratitis varies by region: 30.9% in North Central Nigeria, 26.7% in Western Nigeria, 11.9% in Eastern Nigeria, and 15.8% in Western Nigeria.

In East Africa, a study reported that 62% of microbial keratitis cases were fungal in origin, with an additional 7% being mixed bacterial and fungal infections. Similarly, in Ethiopia, fungi accounted for 45% of microbial keratitis cases.

The high prevalence of fungal keratitis in these regions is often associated with ocular trauma, particularly among agricultural workers who are frequently exposed to plant material and foreign bodies. This occupational hazard is compounded by limited access to appropriate eye protection and healthcare facilities, leading to delayed presentations and poor outcomes.

Overall, infectious keratitis poses a substantial public health challenge in Africa, necessitating improved awareness, preventive measures, and access to timely and effective treatment to reduce the burden of this disease.



Thank you for your attention

Questions!